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Evergreen windbreaks for Iowa farmsteads

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Campbell and Gray Evergreen windbreaks for Iowa farmsteads

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Evergreen Windbreaks for Iowa Farmsteads

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TEN GOOD PLANTING RULES

1. Plant only dormant trees, i. e. trees on which none of the new growth for the season has taken place.
2. Do not expose roots to wind and sun. A few seconds may be too much. Best planting time is on cool, humid, cloudy days when there is a good supply of moisture in the soil.
3. Dig the hole large enough and deep enough to accommodate the root system.
4. Spread out the roots in their natural position. Avoid cramping or bending.
5. Set the tree slightly deeper than it was in the nursery.
6. Place the best soil in the bottom of the hole around the roots.
7. Do not allow leaves or other debris to slide into the hole.
8. Tamp soil firmly against the roots of the trees. Light pats are insufficient.
9. Cover tamped earth with a mulch of loose soil or vegetative material to conserve moisture and prevent "baking."
10. Remove grass and weeds that may offer competition to the trees.

Evergreen Windbreaks for Iowa Farmsteads

BY R. B. CAMPBELL AND R. B. GRAU

A windbreak, as we generally think of it in Iowa, is a narrow belt of trees planted to give the farmstead protection against winter winds. Much of Iowa's land is relatively level to gently rolling. There is little native timber except along rivers and streams. This combination permits northwesterly winter winds to make a clean sweep across the land. Something is needed to break their force.

WHAT A WINDBREAK DOES

Shelters Farmstead ;

Most of us want greater comfort for our farm homes. No amount of other improvements will replace a windbreak for protection from winter winds. A windbreak will make the



Fig. 1. This farm place is completely barren of protection. Note the expanse over which winter winds can sweep. A good windbreak here could greatly increase winter comfort for the family and for livestock.

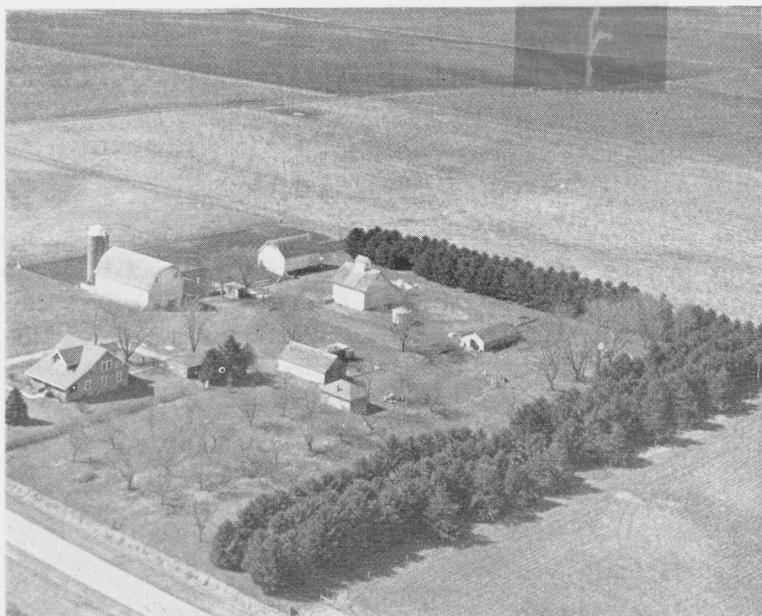


Fig. 2. A windbreak of spruce in Story County which is giving excellent protection. Note the location of the buildings with reference to the windbreak.

home more comfortable.^{1a} Fuel requirements can be cut by as much as a third.^{#6}

A windbreak means a good deal, too, when working outdoors around the barns and lots. Livestock can be kept in condition on less feed when protected from the cold.^{1c} A good windbreak permits you to keep livestock in lots when you ordinarily would have to keep them inside. ^{1d}

Holds Snow ²

A windbreak will prove its worth after every snowstorm. It will keep the snow from banking around buildings and blocking the farm lot. ^{2a}

The snow is held within the rows of trees or near them. It melts slowly, distributing the moisture over a longer time in a manner which helps the trees themselves. ^{2b}

Adds Beauty and Value ³

A good windbreak adds to the beauty of your farm.^{3a} It makes farming more pleasant.^{3b} You'll find, too, that ornamental trees, shrubs and flowers are more easily grown on a

protected farmstead.^{3c} And useful birds are attracted where trees are provided for nesting and protection.^{3d}

Should you decide to sell your farm, its value will be increased by a windbreak planting.^{3e}

Shelters Wildlife ⁴

An added function of a windbreak is to give shelter to pheasants, quail, songbirds and other wildlife during the winter. Many times a good windbreak will mean the difference between survival and death of game birds.

ESSENTIALS OF A GOOD WINDBREAK TREE

Evergreens Best

Evergreens are generally best for use as a windbreak because they hold their needles throughout the year, and thus maintain their efficiency in breaking the wind. Trees which lose their leaves in the winter must be planted in a wider belt if they are to give satisfactory protection.

If you have plenty of land for the windbreak, you may want to combine evergreens with broad-leafed trees. The

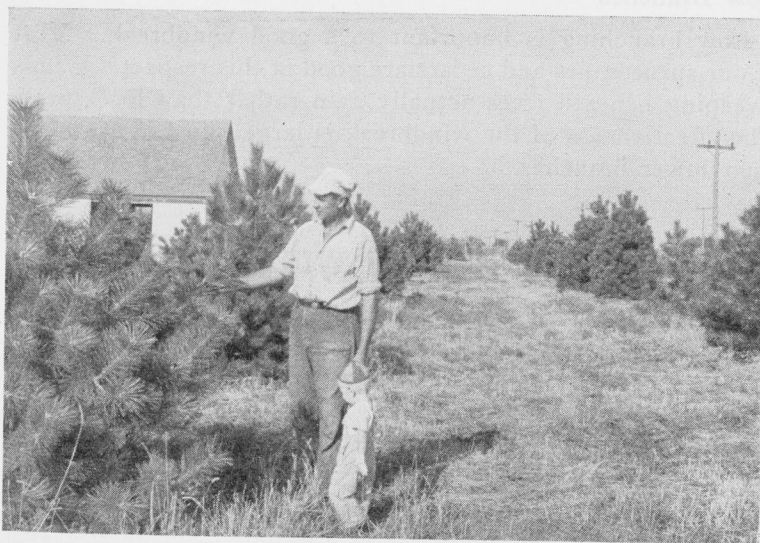


Fig. 3. This windbreak of Austrian pine in Jasper County was planted 7 years ago.

broad-leaved trees will give some quick, temporary protection while the evergreens are reaching an effective size. If this is done, two or three rows of the broad-leaved trees should be planted. But they should be placed at least 30 feet from the evergreen belt so they will not compete with the evergreens. Planted on the south side of the east-west row of evergreens and to the west of the north-south row, the broad-leaved trees will protect young evergreens from hot summer winds. They can be removed later if they begin retarding the growth of the evergreens.

Such trees as native cottonwood, Russian olive, Chinese elm, willow and Tartarian honeysuckle are suitable for this temporary protection. They grow amazingly fast but they are short-lived, and the Chinese elms are susceptible to wind and frost damage.

Rapid Growth, Long Life

For a permanent windbreak you'll want to plant trees which grow rapidly; but don't consider this point to the exclusion of all others. Most evergreens will give good protection in 8 to 12 years, and will become better as the years pass.

Low Branches

Low branching is important to a good windbreak. Most of our spruces, firs and cedars are good in this respect. Winds sweeping beneath trees actually gain rather than lose speed. The effectiveness of the windbreak is largely lost if trees lose their lower branches.

PLANNING YOUR WINDBREAK

Selecting Site

Prevailing winter winds in Iowa are from the northwest. So the windbreak should be located on the north and west sides of the farmstead. Planting to the south will shut off summer winds. This also may happen if the windbreak on the north and west is located too close to the main farm buildings. A good rule is to locate the windbreak between 100 and 200 feet from the house and barn.

The most effective zone of protection extends a distance

of from six to eight times the height of the windbreak. For example, if your windbreak is 30 feet high, the best zone would extend from 180 to 240 feet.

Each farm presents an individual problem in locating a

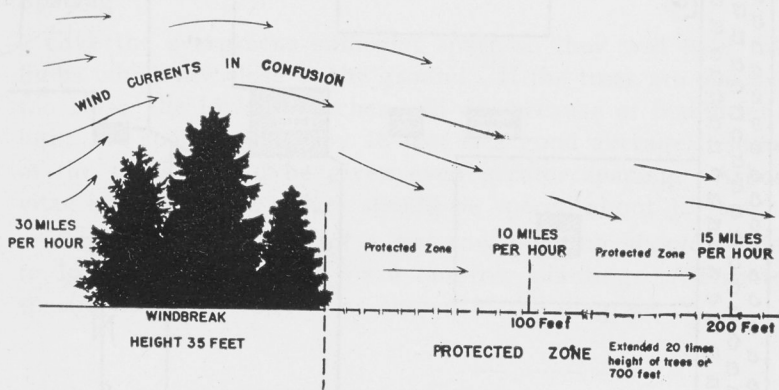


Fig. 4. Effect of a windbreak on wind velocity.

windbreak. Figures 5, 6 and 7 are sample plans for different farms. One of them may fit your own situation.

Slope and drainage, as well as building arrangement, should be considered when you select your windbreak location. If your land slopes steeply away from the farmstead, you may want to plant the belt of trees closer than 100 feet to the buildings. Otherwise the trees will be so far below the buildings that little protection will be given.

Selecting Species

The kind of trees to plant will depend largely on the soil and locality. In any event, it's a good plan to plant more than one species. This allows you to combine the advantages of each, and if one particular species should die, the effectiveness of the windbreak will not be completely lost.

A good combination for most of Iowa consists of Douglas fir in the north and west rows, one of the pines in the center rows, and one of the spruces in the east and south rows. Douglas fir grows fairly rapidly and is quite hardy. This makes it an ideal tree for the outside where it will bear the brunt of the winter winds.

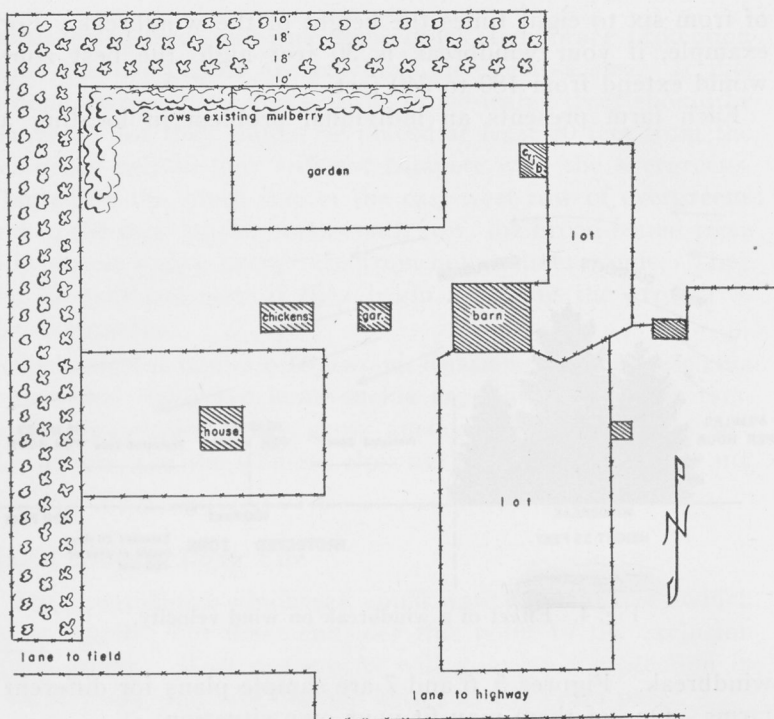


Fig. 5. Diagram of the location of a windbreak for a farm place facing south or east. The buildings on this farm are in the zone of best protection.

Pine grows most rapidly of the three. So it should be planted in the center row to provide the crown or highest point of the windbreak. Spruce grows rather slowly, but it has a compact foliage and forms a dense cover for the lower portion of the windbreak.

In general, Iowa soils are well suited to any species of evergreen. Only where there are exceptionally sandy or marshy spots will you need to give serious thought to choosing trees to fit the soil. Of course, the trees will not thrive on alkaline soils. (A more detailed description of species recommended for windbreak planting will be found in the last section of this bulletin.)

Number of Rows

Whenever possible, use at least three rows of trees. Evergreen windbreaks are permanent, so enough rows should be

planted to insure the efficiency of the planting, even though single trees are occasionally lost. With three or more rows, a tree may be lost here and there without causing a serious draft. With one row, and even two, the loss of one tree may greatly reduce the windbreak's effectiveness.

Spacing

Give the evergreens sufficient space so they will hold the limbs which are close to the ground. If the trees are planted too close, the lower branches will die because of insufficient light. A spacing of 18 by 18 feet is a good average. Some of the pines should be given even greater spacing. Arbor vitae or any of the cedars should be spaced about 12 feet.

The average spacing for a two-row planting should be 14 to 16 feet, with 12 feet for a one-row planting. Alternate spacing is recommended, as shown in the diagram.

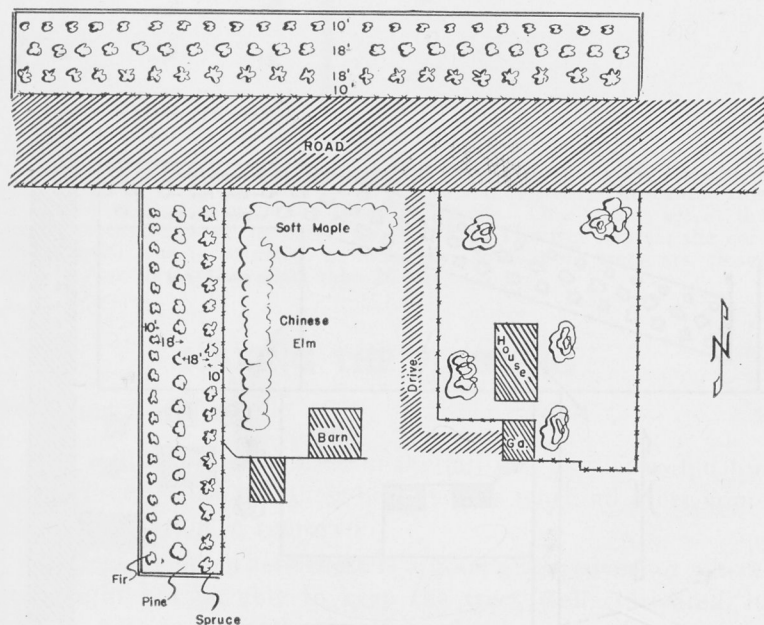


Fig. 6. Windbreak plan for a farm place facing north where it is possible to plant a belt of trees across the road. This plan might also be used for a farmstead facing west. The north belt is extended westward to offset the draft caused by the road.

If a temporary windbreak of fast-growing broad-leaved trees is planted in conjunction with the windbreak, the trees in the temporary belt should be spaced 6 feet apart in the row and 6 feet between the rows.

Corners

Arranging the trees at the corners of "L" shaped windbreaks often proves confusing, and results in overcrowding. This can be prevented by following a simple plan of spotting trees from either end to the corner of the "L." Then arrange the trees in the corner so that (1) there is one tree at the corner of each row; (2) there are no trees in a row closer than 14 feet, or farther apart than 20 feet.

For example, if the corner tree of a row is 30 feet from the next tree regularly spotted before reaching the corner, another tree could be placed at the mid-point, or 15 feet.

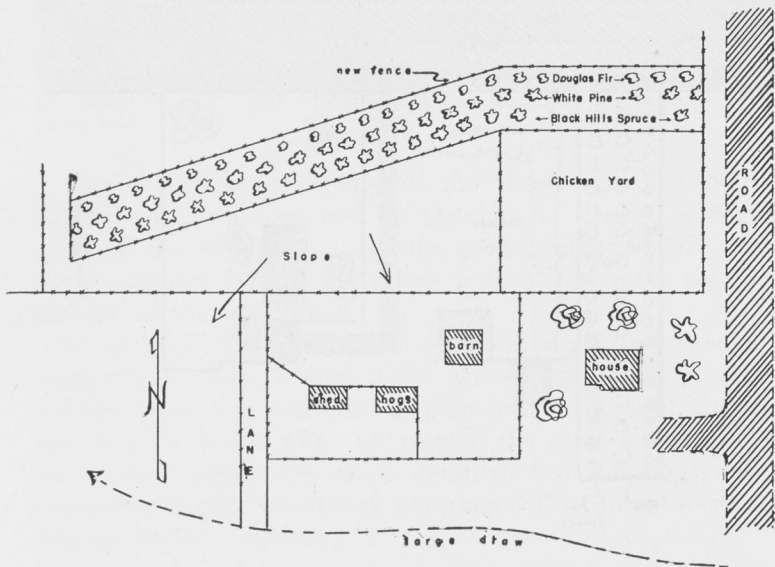


Fig. 7. On this farm place it was not advisable to plant a belt of trees to the west because of poor drainage. The north belt has been extended westward to help take the place of the west belt.

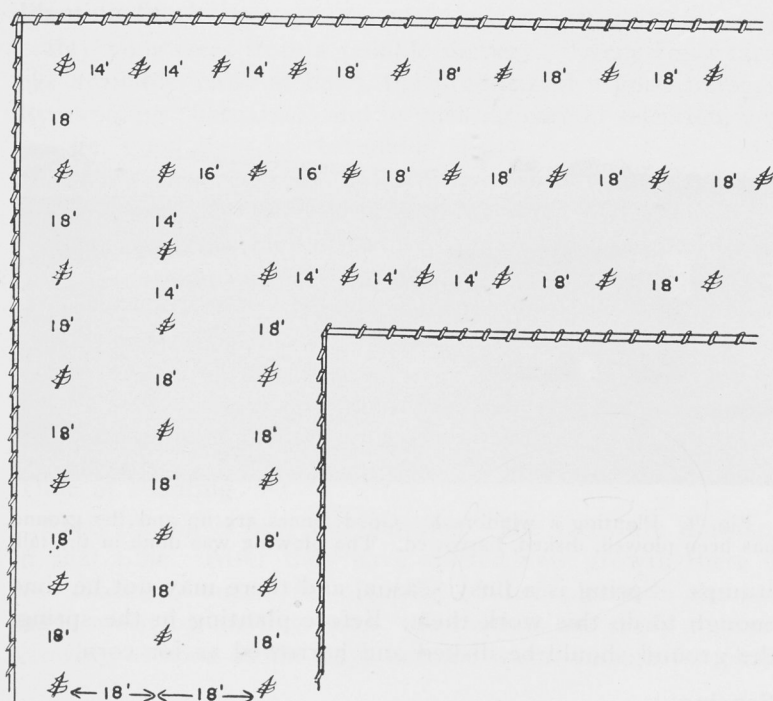


Fig. 8. Method of spacing and corner arrangement. Note that trees are spotted from either end of the "L" to the corner. The center row is spaced alternately with the other two rows. One tree is set at the corner of each row at the corner of the "L." The tree nearest the corner in each row is adjusted, if necessary, so that no trees are closer than 14 feet nor farther apart than 20 feet.

MAKING THE PLANTING

Preparing the Site

It is well to plow the area in the fall just as you would for corn. Trees will make their best growth when all other competing vegetation is removed.

On steep slopes where there is a good grass cover, or where you might not be able to keep the trees well cultivated, it may be best to leave the area in sod. A circle of sod about 4 feet in diameter should be removed where each tree is to be planted.

Other preliminary work also should be done in the fall. This includes fencing and removing interfering trees and



Fig. 9. Planting a windbreak. Good fences are up and the ground has been plowed, disked, harrowed. The plowing was done in the fall.

stumps. Spring is a busy season, and there may not be time enough to do this work then. Before planting in the spring, the ground should be disked and harrowed as for corn.

Fencing

Have a fence in place by the time planting starts. At least 10 feet of space should be left between the fence and the outside rows of trees. Build a permanent fence which will keep out all livestock, including poultry.

Avoiding Barnyard Drainage

If your windbreak must be planted where the ground is soaked by manure drainage, additional preparation is necessary. Evergreen trees cannot live in soils excessively enriched by manure. If the ground slopes down from the barnyard toward the windbreak, build some dikes to keep the water from flowing into or across the windbreak. The wash can be diverted around the area, or it can be concentrated at some point where it can be carried through the windbreak by a ditch or large tile to avoid damaging the trees.

In excessively rich soils plant a crop such as sudan grass for a year or two before setting the trees. This generally will remove much of the excess richness from the soil so the evergreens can thrive. Before plowing, cut and remove the sudan so that only the stubble will be turned under.

Planting Stock

Buy your trees from a reliable nursery. Every Iowa farm has available, close at hand, the products of a good nursery. By avoiding "bargains," and by making careful selection, you can get good trees at reasonable cost.

Be sure the evergreens you buy have been transplanted at least once in the nursery. Evergreens that have been transplanted only once are satisfactory and are the most economical. Those that have been transplanted more than once may be excellent for windbreak planting, but are much more expensive.

Seedlings are trees which have not been transplanted in the nursery. Seedling evergreens are cheaper than the transplants, but their chances of survival are much lower.

Time of Planting

Early /spring is best for planting. The trees are dormant at that time. After they have started new growth there is less chance of successful planting. When placed in the soil made moist by melting snow, the rootlets are ready to start growing as soon as the days become warm enough for plant



Fig. 10. Drainage from this barnyard has killed all the trees in the draw. Evergreen trees should not be planted where there is any concentration of barnyard drainage unless this wash can be diverted.

activity. The soil will be in its best condition in the spring if it has been plowed in the fall.

"The earlier the better" is probably a good planting rule to follow. No planting should be done later than 4 weeks after the frost goes out.

You could plant during late winter if the soil were not frozen, but there's danger of the trees heaving by frost if cold weather returns before spring. You could also plant in the fall, but you stand a chance of considerable winter injury to the trees.

Keep Roots Moist

When planting remember that protection of the roots is the most important item. Cells of root tips of evergreens contain a resinous sap, which quickly hardens when exposed to drying conditions. Once hardened, this sap cannot be returned to its original fluid state. In a solid state it prohibits the normal functions of the cells. Exposure of only a very few minutes is enough at times to kill or seriously damage the tree.

Get ready for the trees before they arrive so they can be handled as quickly as possible. If the nursery is close enough, you may find it wise to call for the trees yourself. This will give you a chance to make your own selection. And you

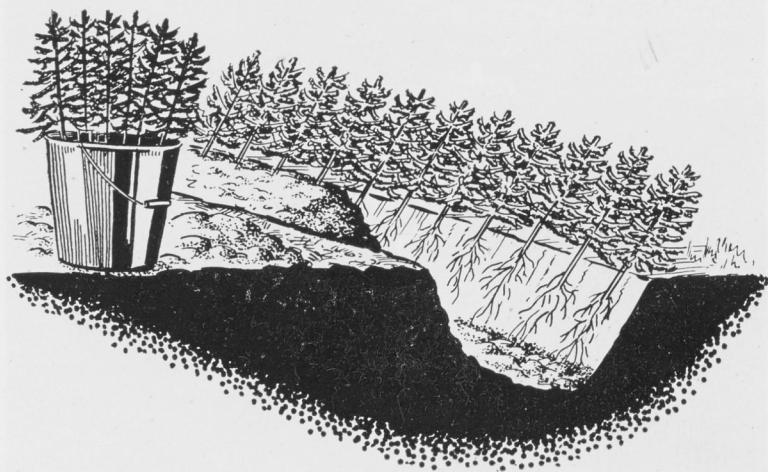


Fig. 11. Heeling-in. Trees are laid on the sloping side of the trench and the roots quickly and compactly covered with moist soil. The pail contains a soupy mixture of mud and water. This will keep the roots of the trees moist when carrying them to the planting area.

can get the trees to the planting site in better condition than if they have to be packed and shipped. While nurseries can pack trees well enough to be shipped at small risk, they can't pack them to prevent loss if the shipment should be delayed for a considerable time in heated cars or warehouses.

Heeling-In

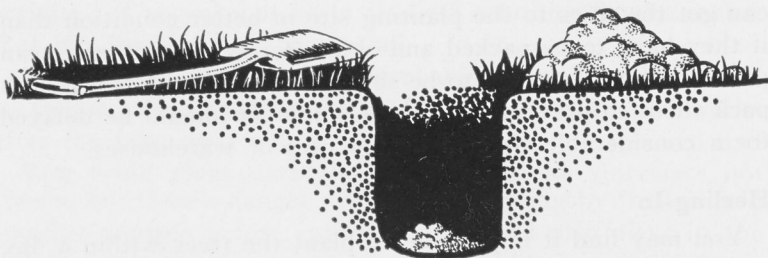
You may find it impossible to plant the trees within a day or so after they arrive. In that case you should place them in a "heel-in" trench. This means lining out the trees a few inches apart in a trench, and compactly covering the roots with moist soil. Dig this trench at some spot near the planting site and in the shade. It should be deep enough to accommodate the tree roots and long enough for all the trees. One side of the ditch should be sloped, and the soil piled upon the opposite side. Place the trees on the sloping side with the roots in the trench. Heel-in only a few trees at a time. Do not open the bale of trees until this trench is ready. When it is ready, take out a few trees and quickly re-cover the remaining trees with the bundle wrappings. If it is sunny or windy, place a covering such as wet burlap over the "heel-in" trees. If necessary you can keep trees in this trench for several days without great danger of loss.

Moving Trees

When moving the trees to the location where they are to be planted, expose the roots to the air as little as possible. A good plan is to prepare a thick, soupy, mud mixture in a large bucket, with enough of the mixture to cover the roots of the trees. The mud should not be so thick that the small rootlets will be torn in pulling them from the bucket, nor so thin that the soil particles clinging to the roots will be washed away. Don't carry more than 6 to 10 trees in the bucket at one time. These should be taken directly to the planting site. When you remove the trees from the "heel-in" trench, lift them out carefully with a spade (don't pull) so that none of the small rootlets will be torn. Keep the remaining trees in the trench well covered with soil.

Setting

You can save time if you lay out the rows and set stakes wherever trees are to be planted. Then dig the holes just



12a. Dig the hole wide and deep enough to accommodate the root system without crowding. Make a firm mound of earth in the bottom of the hole.

as the trees are brought for planting, in order that the sides of the holes will not dry out. Be sure that the hole is deep enough so that the tree can be set just a little lower than it was in the nursery. Make the hole wide enough so that the roots can be spread outward in a natural position. Avoid bunching or curling the roots. If the hole needs more digging after you have removed a tree from the bucket, replace the tree in the bucket with the roots well covered until the hole is ready.



12b. Spread the roots uniformly outward and downward over the mound. The tree should be set only slightly deeper than it grew in the nursery.

If there are any large roots which have been broken, prune them off with a sharp knife or shears just above the break. If there are any long roots with very few small rootlets on them, shorten them to conform to the size of the hole dug for the tree. Make all cuts smooth and clean.

When the hole is deep and wide enough, place some moist soil in the center. Use it to shape up a firm mound as a base upon which you can place the tree. Spread the roots *outward* and *downward* around this mound. In this position, more moisture and soil nutrients will be available to the tree than if the roots were bunched, and the roots can begin growing in the same manner as before transplanting.

Now as quickly as possible push in some moist topsoil. Pack this soil firmly with your fist or carefully with your heel to

eliminate all air pockets and to get the moist soil well in contact with the smallest roots. Be careful not to strip any roots while packing. Add and pack small amounts of soil until the hole is nearly filled. Fill the remainder of the hole with loose soil.

Do not leave trees long in the mud mixture. If there should be an interruption of several hours in the planting, return the trees left in the bucket to the "heel-in" trench.

Do not place water in the bottom of the hole before planting. This causes air spaces to be left around the roots after the water drains away. The soil is usually sufficiently moist in the spring so that no watering is necessary. If the soil is rather dry, water the tree after the hole has been about three-fourths filled with soil. Then fill the remainder of the hole with loose soil to prevent the surface from "baking."

Do not "head-back" or prune evergreen trees before planting except to remove dead limbs.

If at all possible, plant all of the trees on the same day you receive them. The sooner the trees are in the ground, the sooner they can take advantage of the good growing conditions in the spring, and the less opportunity there is for them to be damaged before planting.

Do not leave extra trees in the "heel-in" bed. Plant them in the garden or some other place where they can be easily cared for. You can use these trees for replacements in later years.



12c. Place moist soil over the roots and firm it with your heel.



12d. Scatter loose soil over surface of soil to prevent "baking" of surface.



Fig. 13. A good job of mulching. By mulching the entire row, this farmer has reduced the amount of weeding necessary. Mulching will also conserve moisture during the dry parts of the summer. The corn will be left standing over winter to aid in accumulation of snow.

CARE OF THE WINDBREAK

Mulching

Mulching consists of placing some material such as straw about the base of the plant. Heavy straw, such as flax, wheat or soybean straw, is most suitable since it will not blow so badly. Coarsely ground corncobs or sawdust also makes an excellent mulch. The mulch should be as clean as possible. Any weed seeds or grain in the mulch will often attract poultry, which can seriously harm the trees.

Never use manure or manured straw, as it will harm the trees. Place the mulch for a radius of about 2 or 3 feet around the tree, and up to within a few inches of the stem. There is a greater possibility of mice damage if the mulch is placed in contact with the stem of the tree.

Place enough mulch around the tree so that weeds and grass will not grow through it. Add more mulch when it has settled or decayed.

There are four good reasons for mulching:

1. Mulching prevents weed growth about the tree and reduces the amount of cultivation necessary. If you have enough mulch available to cover a strip 5 to 6 feet wide along

the entire row of trees, the problem of cultivating the area between the trees in the row is solved.

2. Mulching helps to hold moisture. During dry periods, winter or summer, a good mulch will often save a tree from damage or death.

3. Mulching protects newly planted trees against frost-heaving, since it helps to maintain an even surface soil temperature throughout the winter.

4. Mulching increases the early growth rate of the trees. The effect is especially noticeable during dry seasons.

Examine the mulch frequently for the presence of rodents, especially field mice. Place poison bait if rodents are present.

Cultivation

Cultivate between the rows of trees for several years after planting. Working the surface soil reduces moisture losses due to evaporation, and keeps down weed competition. You can plant a garden between the rows and easily care for the trees at the same time as the garden. A good practice is to plant sweet corn or popcorn between the rows and leave the stalks standing over winter that they may aid in gathering snow. Moisture from snow will benefit the trees.

Don't cultivate with a machine cultivator closer than 3 or 4 feet to the trees, as you may damage the surface roots. If you do not mulch, cultivate directly around the trees with a hoe.

Sow the area to grass after the trees have reached an average height of around 6 feet. Keep the grass mowed. Grass will compete with the trees for moisture, but as the trees get larger it is almost impossible to cultivate between them. Then grass will tend to keep out some of the tall growing weeds.

PROTECTION

Animals and Poultry

Livestock, poultry, rabbits and rodents are often a major source of trouble for windbreak plantings. You can best prevent damage from these sources by setting up a good tight fence around the windbreak.



Fig. 14. Livestock have ruined this windbreak. Foliage will never grow again on these lower limbs.



Fig. 15. Roots exposed by chickens scratching beneath the tree die, causing damage or death to the tree. In early spring chickens pick off tender buds, thus preventing new growth.

Chickens will pick off the tender buds of evergreens in the early spring. They also will scratch in the soil under trees and often expose and kill many of the surface roots. Geese will completely defoliate small evergreen trees. When poultry is allowed to roost in evergreens, the accumulation of manure will sometimes kill the trees.

Farm animals browse upon the trees, break or injure them by trampling and rubbing, and pack the soil in the area making it less permeable to moisture. When the foliage has been eaten from the lower limbs of an evergreen, these branches die and the effectiveness of the lower portion of the windbreak is lost. An evergreen cannot recover its foliage as can a broad-leaved tree.

Rabbits can injure or kill young trees during the winter months. They eat the needles and young shoots, and strip the bark. You can protect your windbreak against rabbits while the trees are small by placing closely woven wire around each tree. You can also keep rabbit numbers down by shooting and trapping. Keeping other forms of vegetation out of the windbreak area will reduce the amount of cover for rabbits, and will help to keep the population down.

Rodents are another serious pest. Mice will girdle trees up to 4 inches in diameter. Pocket gophers can completely sever roots 3 to 4 inches in diameter and frequently cause the death of trees up to 12 feet in height. You can successfully protect your trees against most rodents by poisoning.

Diseases and Insects

Several diseases and insects affect evergreens. This publication will make no attempt to discuss diseases and insects and their control. Keep a close check on the trees in your windbreak, and when you note an unusual condition, contact your county extension director or some other reliable source of information. The sooner you can check an insect infestation or a disease, the less damage will be done to your trees.

Thinning

It should not be necessary to remove any of the trees from your windbreak unless they were planted too close. Some farmers plant trees close at the outset in order to get a compact belt of trees quickly. This is good practice if, just as

soon as the lower branches of the trees begin to interlace, you will remove every other tree from the belt. If this is not done, the competition for light will kill the lower branches, and the lower portion of the windbreak will be open and ineffective. You can very likely use the trees which you remove either for Christmas trees or for transplanting to some other location.

Pruning

You will seldom find it necessary or advisable to do any pruning in your windbreak. Removal of live limbs in an evergreen windbreak, of course, reduces the efficiency of the windbreak. About the only pruning necessary might be the removal of diseased or dead limbs.

DESCRIPTION OF TREES FOR PLANTING

WHITE PINE (*Pinus strobus*)

White pine is a native of northeastern Iowa, northeastern United States and the Great Lakes region. It prefers those soils which are at least moderately porous and well drained. Many early Iowa windbreaks were of this species.

It is an admirable tree for windbreak planting, due to the ease with which it can be transplanted successfully, its long life and its rapid growth. Heights of 20 feet in 10 years are not uncommon. Growing in the open, however, it forms large, long branches which tend to become brittle and will often break off in ice storms or heavy snow. This objection can be overcome by planting pine with other evergreens, using the pine to form the upper portion of the windbreak and spruces or firs to form the lower portion.

A straight, tall-growing tree, white pine often reaches heights of 70 to 80 feet. Its shape is conical, tending to become round topped in later years.

White pine has not been planted so much in recent years due to a disease known as blister rust. In Iowa, the disease has been found only on some of the trees in a few northeastern counties of the state. One stage of the disease exists on gooseberry or currant bushes. If these plants are eliminated

within 900 feet of the pines, the trees are safe from the disease. Where a great many gooseberry or currant bushes are near the proposed planting area, white pine should not be planted unless these bushes can be eliminated. On most farmsteads, however, there are few of these bushes, and white pine can be safely planted.

AUSTRIAN PINE

(*Pinus nigra austriaca*)

A European immigrant which has gained wide use for windbreak planting in Iowa, Austrian pine flourishes on well drained soils from fertile to sandy and moist to dry. Its drouth resistance was well illustrated in the years of 1934-36.

Growth is quite rapid. Eighteen inches per year is commonplace. It is long-lived and will attain heights of 50 to 60 feet in Iowa.

This tree demands a great deal of sunlight, and in even slightly crowded conditions will lose its lower branches. It develops long branches, a rounded top and a moderately dense foliage.

RED PINE (*Pinus resinosa*)

One of the principal pines of the Lake States, the red pine is suitable for planting in much of eastern Iowa. It is capable of rapid growth and good height, but does not do well in drouth conditions.

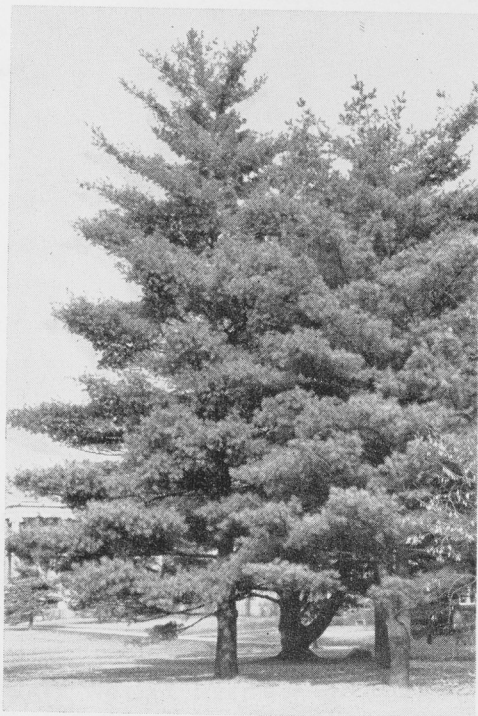


Fig. 16. White pine.



Fig. 17. Austrian pine.

Red pine does well on very sandy, deep, well drained soils and is recommended for windbreak planting only on soils too sandy for other evergreens. It is a sun-loving tree, and will lose its lower branches to some extent even when standing alone.

PONDEROSA OR WESTERN YELLOW PINE (*Pinus ponderosa*)

Ponderosa or Western yellow pine can grow under dry conditions. The form of the tree is similar to Austrian pine, and its growth rate and height are also similar. The foliage is rather sparse. For this reason it cannot be recommended highly for windbreak purposes. It is also a sun-loving tree, and will often lose its lower branches even when open grown.

SCOTCH PINE (*Pinus sylvestris*)

Scotch pine is not generally recommended for windbreak planting. Soil requirements and growth rate are similar to white pine, but it usually grows into a poor shape, and develops a flat top in early years. It is extremely intolerant of shade, and will lose its lower branches early in life. It is not drouth resistant, except on the better, well drained soils. It seldom attains a height of over 40 feet.

Fig. 18. White spruce.



JACK PINE (*Pinus banksiana*)

Jack pine is a poor windbreak tree. Like Scotch pine, it is poorly shaped. It is intolerant of shade, and loses its lower branches early in life. It seldom exceeds a height of 30 feet in Iowa; it has a narrow crown spread and a sparse foliage. However, jack pine will grow on the sandiest soils and make rapid growth.

WHITE AND BLACK HILLS SPRUCES (*Picea glauca* and *Picea glauca albertiana*)

White spruce has been popular for both windbreak and ornamental planting for many years. It grows best on moist, well drained, fertile soils, but seems to be able to stand a good deal of variation in this respect. Survival during the drouth of 1934-36 was good.

White spruce develops a symmetrical conical shape, dense foliage, and holds its branches low to the ground. It may reach heights of 40 to 50 feet in Iowa. Growth of about a foot per year is average.

Though it is not as easy to transplant as the pines, nor so



Fig. 19. Douglas fir.

rapid in growth, it will make a very dense and effective wind-break.

The Black Hills spruce is another form of the white spruce. It is said to be more drouth resistant. It is quite similar in appearance and characteristics.

NORWAY SPRUCE (*Picea excelsa*)

Norway spruce will grow well on moist, well drained, fertile soils, but can stand only moderately dry conditions. Some of these spruces were lost in the drouth of 1934-36, especially in the more closely spaced windbreaks.

Norway spruce will make rapid growth, often 2 feet per year, and attains heights of 50 to 60 feet. It maintains a fairly dense foliage until it reaches the age of 35 to 40 years, when the branches and foliage begin to thin.

This tree is favored for windbreak planting, especially in eastern Iowa, due principally to its rapid growth.

BLUE SPRUCE (*Picea pungens*)

Blue spruce will grow on a variety of soils from moderately rich and dry, to moist, gravelly, sandy or rocky. Though it

Fig. 20 . Eastern red cedar.



requires considerable care to transplant successfully, once established it is quite hardy and drouth resistant.

It is highly favored as an ornamental, due to its blue foliage and symmetrical conical form. Not all blue spruce have the blue tinge to their needles, but all have the form as well as exceedingly dense foliage held close to the ground. The cost of blue spruce is generally rather high, but trees without the blue cast to the foliage usually can be purchased reasonably. The rate of growth and possible height are similar to white spruce.

DOUGLAS FIR (*Pseudotsuga taxifolia*)

Due to its wide adaptabilities, Douglas fir is admirably suited for planting in Iowa, where we have considerable change in climatic conditions. It is one of our best windbreak trees.

It is one of the most rapid growing evergreens in Iowa, often making a growth of 18 inches to 24 inches in a year. It is deep rooted, and grows on a variety of soils, but prefers those well drained and porous. Heights of 50 feet to 60 feet are attained in Iowa, and long life can be expected.

The foliage is soft, and occasionally the needles have a bluish tinge. It forms a dense pyramidal crown, and in the open will retain its lower branches.

Douglas fir begins growth early in the spring. Occasionally a late freeze in northwest Iowa will kill these new shoots, but only rarely is the tree killed.

BALSAM FIR (*Abies balsamen*)

Balsam fir has not been planted much for windbreaks in recent years. It does well on many soils from thin and rocky to heavy and fertile, but requires considerable moisture. It can be planted successfully over much of northeastern Iowa.

The balsam develops a narrow conical shape, and has a soft foliage of medium density held low to the ground. Growth will average about a foot per year, and heights of 30 to 40 feet are attained. It will grow under moderate shade quite well, and might be considered seriously as a good tree for underplanting in some of our thinning hardwood groves in the eastern portion of the state.

CONCOLOR OR WHITE FIR (*Abies concolor*)

White fir has been planted very little for windbreaks, due to prohibitive costs, but would make a beautiful windbreak tree if cost were no object.

This tree develops a form and color similar to blue spruce. It will maintain branches low to the ground, even in later years, and will attain heights of 40 to 60 feet. It has been successfully planted over much of Iowa on well drained, fertile soils.

EASTERN RED CEDAR (*Juniperus virginiana*)

Eastern red cedar is the only native evergreen found naturally all over Iowa. It grows well on dry ridges and moist bottomlands, making it one of the most versatile of our evergreens.

The tree does not grow tall, but in windbreaks has grown to 20 to 40 feet; it is capable of long life. Its crown is very compact and dense, formed of short, slender branches extending to the ground. With age, the crown broadens or becomes irregular. The red cedar is very shade tolerant, which makes it a good tree for close spacing.

A serious disadvantage of the red cedar is that it harbors a disease known as cedar apple rust. This disease, although not often seriously affecting the red cedar, causes a leaf and fruit injury to the alternate host of the disease, the apple. A windbreak of red cedars, therefore, should not be placed within 2 miles (the principal limit of infection for the disease) from an orchard.

ARBOR VITAE OR WHITE CEDAR (*Thuja occidentalis*)

The crown of arbor vitae develops into a compact mass with rather a wide base. Heights of 30 feet are sometimes attained in Iowa. It will grow on moist, swampy areas, where it is found naturally, but has done well even on ridges with thin soils, if there is sufficient moisture. It is very tolerant of shade, so it can be spaced closely together without injury to side branches, and even underplanted in thin stands of trees. It grows more than a foot a year for several years in early life, but grows very little after reaching a height of 20 to 25 feet.

Many windbreaks which have begun to open up in the lower portion could be repaired by planting a row of white cedar along the edge. Because white cedar can be planted close together, an old windbreak could soon be giving good protection again if tightened up with white cedar. Many windbreaks have moist or swampy spots in them where other evergreens will not grow. White cedar can usually grow in these locations and fill in the opening.

The chief objection to arbor vitae as a windbreak is its susceptibility to winter injury. This injury occurs commonly wherever there is a deficiency of moisture in the soil during winter months. The tree has the ability to recover if not too badly damaged.

TEN POINTERS ON WINDBREAKS

1. Select evergreen trees adapted to your locality.
2. Buy trees that have been transplanted at least once in the nursery.
3. Plan for three or more rows of trees. Space trees 16 to 18 feet in and between rows.
4. Plant the trees as soon as possible after the frost leaves the ground in the spring.
5. Avoid areas subject to manure drainage.
6. Place windbreak so that main buildings are between 100 and 200 feet away.
7. Mulch trees well with clean straw soon after planting.
8. Cultivate between rows for several years after planting.
9. Replace tree losses the next planting season.
10. **Never** allow livestock or poultry in the windbreak area, even for a short time, regardless of the size and age of the trees.